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ABSTRACT

Faculty and students face new challenges and questions regarding their roles in the emerging learning paradigm brought on by educational technology. This paper discusses six shifts from traditional educational institutions to a learner-centered university. Changes and developments include: (1) the teacher: from instructional deliverer to learning facilitator and guide; (2) the student: from passive to active learner; (3) increased technology access and the development of learners' information skills; (4) support for change and the faculty development partnership; (5) use of electronic portfolios for "testing" students and teacher evaluation which emphasizes preparation and research (rather than classroom time) as an indicator of success; and (6) an integrated approach system for overcoming obstacles, based on partnerships, mentoring, and resource sharing. A list of recommendations for faculty development follows this final shift. In addition, a list of learning strategies are described, together with their suggested technology supports; strategies include the metacognitive, cognitive, and social/affective. (Contains 27 references.) (AEF)

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The Shift to a Learner-Centered University: New Roles for Faculty, Students, and Technology

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The Process

Multimedia, the Internet, computer conferences, listservs, relational databases ... Rapid advances in educational technology have opened an entire universe of information retrieval and use possibilities to instructors and students. Instead of being confined and constrained by the limits of a traditional curriculum and texts, teachers can free students to explore their own interest areas, tap background resources, consult with experts, and collaborate with peers. Teachers no longer need to be catalysts, vehicles, and judges for the learning process. Instead, they can encourage learners to be explorers driven by curiosity and personal interests. Students can assume responsibility for meeting their own needs and for finding that life-long learning is indeed fun. Interaction, instruction, collaboration, investigation, and learning opportunities can all play a decidedly positive role in learning.

Yet this ready access to information and learning independence can easily overwhelm teachers and students as they struggle to organize and filter the flood of possibilities. Some teachers refuse to take advantage of these information supplements, fearing obsolescence if machines prove to be more efficient knowledge deliverers or, worse, if they actually become 'smart' enough to teach.
Teachers must become comfortable with information access freedom and actively train their students to manage and filter information. Otherwise, learners may find themselves faced with new, uncomfortable situations when they must choose what is important to learn from a wealth of data.
Together faculty and students face new challenges and questions regarding their roles in the emerging learning paradigm. What is teaching? What is learning? What is an expert? How can I learn what the experts don't know? How do I deal with so much knowledge? How can teaching and learning be personal experiences in an over-crowded classroom or through technology supports? Are professors really becoming obsolescent?

Shift 1: The Teacher: From Deliverer to Learning Facilitator and Guide

Traditional classes focus on the teacher as the primary information source. It is up to the teacher to lead students via the curriculum and texts toward a predetermined outcome. Students' success or failure is marked by their ability to master a body of information presented in lectures or texts.

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Under this traditional approach, success depends heavily on the teacher's ability to engage the class in a process of knowledge assimilation. Teachers often concur that failure occurs because students don't enter a class with 'adequate' preparation. Or perhaps they aren't as good as students were in the 'old days'? ... Or perhaps a single instructional approach cannot serve all learners.

In a teacher-centered class, learners often function as passive receivers, a role works well for some, but not all as evidenced by absenteeism, boredom, and the failure to acquire a specific knowledge set. In teacher-centered environments, professors assume responsibility for determining all learning goals, delivering what they determine to be crucial information, providing feedback, and assessing all production and learning outcomes. Students have little or no role in designing or influencing content, materials, or approaches. What interaction does occur between deliverer and receiver is often a function of class size rather than a means of supporting students' learning needs.

However, this shift to a learner-centered class demands a shift in teachers' time management and preparation techniques. It requires a shift in expectations on the part of the teacher as well as the student, and in strategies for old techniques and delivery systems no longer suffice to meet global needs, nor do old assessment paradigms accurately measure outcomes that are determined by individual learners. Collaborative, cooperative, and problem-based learning research suggests that allowing students to actively participate in the learning process encourages the activation of background knowledge, advance organizers, and information schema that help with the assimilation of new knowledge. As more responsibility falls on the learner to pursue interests and explore wide varieties of information, teachers must re-think their roles and shift to a focus on facilitation and guidance rather than on delivery. Preparation time increases while lecturing declines or, in some cases, even disappears. Evaluation procedures require less time as collaboration and cooperation activities decrease the number of papers and projects to correct. Peer editing and evaluation procedures can improve the quality of the output, thus further changing the way faculty engage in corrections, guidance, and feedback.

Thus, the role of 'learner' shifts to both student and teacher as information exploration/discovery and experiential learning opportunities supplement or even replace teacher-driven information delivery. With a focus on exploration, discovery and learning, all participants have opportunities to share and evaluate new information and to offer new interpretations and critical analyses for old ideas.

Shift 2: The Student: From Passive to Active Learner

It is vital for teachers to be familiar with learning theories as well as with approaches that enable students to learn in ways that suit their personalities and personal goals. An understanding of how learning occurs provides teachers with a blueprint for enabling students to take advantage of their own innate abilities, styles, and strategies.

Current research has divided learning styles into four general categories:

Concrete perceivers learn best through direct experience, doing, acting, sensing, feeling;

Abstract perceivers are skilled at analysis, observation, critical thinking;

Active processors are eager to apply new information to facilitate tasks; and

Reflective processors prefer to reflect, think about new information.

Traditional, delivery-oriented education tends to select procedures that best serve those learners who are abstract perceivers and reflective processors. Because of the tendency toward receptive participation, traditional classes can deny or limit contact with the active, hands-on, experiential approach that many students require to facilitate successful learning. Traditional assessment techniques often stresses information retrieval and analysis rather than the ability to apply new concepts to real world or simulated tasks. A single approach to teaching and assessment can result in failure when the same students who might very well excel in a different environment that stresses productive approaches to learning and assessment.

In order to offer all learners the opportunity to succeed, it is vital that teachers provide a wider approach to information access, acquisition, and application processes. Thus, their attention has now shifted to the learner and how to provide a student-centered environment that offers a more eclectic approach to the learning process . Such an environment should accommodate all perceiving and processing styles through a variety of activities and materials. The curriculum that becomes a creation of teachers, learners, and real world needs and places an emphasis on skills of intuition, feeling, sensing, imagination and synthesis, as well as on the traditional skills of analysis, reason, and sequential problem-solving. Thus, students have an opportunity to benefit from all learning styles while facilitating the process of by using the ones with which they are most comfortable.

Therefore, learner-centered instruction provides a connection between all learning styles through experiences, opportunities to conceptualize, experiment, and reflect on discoveries. Students employ all senses, aural, visual, and tactile, in order to participate in all aspects of the learning and comprehension processes. Finally, teachers apply multiple kinds of assessment that emphasize the development of global capacities utilizing all four learning styles, productive as well as receptive.

Freeing learners to use person styles is only one aspect of the successful learner-centered environment. Since learners differ widely in the variety of strategies they choose to apply in a given learning situation, their success also depends on their ability to activate appropriate strategies to think about how to learn (metacognitive strategies), become engaged in the learning process (cognitive strategies), and to interact effectively with peers and experts (social and affective strategies).

Technology makes it possible for students to learn according to their own styles and to apply personal strategies. Once teachers could only hope that students would activate their internal ability to think about learning. Now the technology enables teachers to encourage and even guide activation of metacognitive planning and organization strategies. It provides organizational structures for cognitive approaches to learning. It facilitates and establishes environments for social and affect interactions that would otherwise be difficult if not impossible in a large class. The following table suggests how some of the currently available technologies can provide learning environments that trigger different types of strategies.

Learning Strategies and Technology Supports

Metacognitive Strategies

Strategy	Description	Suggested Technology Supports
Selective attention	Focus on special aspects of learning tasks as directed by teacher, peers or personal interests.	Presentation software, hyperlinked text
Planning	Planning for the organization of either written or spoken discourse.	Outliners, graphs, flowcharts
Advance organizers	Preview main ideas and concepts of the material to be learned	Hypertext, multimedia links, web materials, summaries
Monitoring	Review attention to a task, comprehension of information that should be remembered, or production while it is occurring.	Word processors, PDAs, imaging, review of hyperlinks
Self-monitoring	Check one's comprehension during listening or reading or check accuracy and/or appropriateness of one's oral or written production while it is taking place.	E-mail, spelling and grammar checkers Conferencing, e-mail, peer editing through collaborative writing tools
Evaluation	Check comprehension after completion of a task, or evaluating production after it has taken place.	
Self-evaluation	Check outcomes of one's own learning against a standard.	Real world examples and simulations

Cognitive Strategies

Strategy	Description	Suggested Technology Supports
Rehearsal	Repeat information to remember	Conferencing, e-mail, listserv, video
Resourcing	Use information in text or in supplemental materials to guess the meaning of specialized linguistic items, predict outcomes, or complete missing parts	Dictionaries, encyclopedias, reference materials, background materials, hyperlinks,conferencing/ e-mail for peer support
Summarizing	Intermittently synthesize what one has heard to ensure the information has been retained	Word processing, PDAs, outliners, flowcharts, images, graphs
Note taking	Write key words and concepts in abbreviated verbal, graphic, or numerical form during a listening or reading activity	Word processing, PDAs, outliners, flowcharts, images, graphs
Deduction	Apply rules to understand material.	Problem solving software,

		simulations
Induction	Arrive at a rule through the organization of concepts.	Word processing, PDAs, outliners, flowcharts, images, graphs
Imagery	Use visual images (either generated or actual) to understand and remember new verbal information	flowcharts, images, graphs
Transfer	Apply old information to new task	Problem solving software, simulations, computer conferencing and e-mail discussions
Elaboration	Link new information, or integrate new ideas with known information	Problem solving software, simulations, computer conferencing and e-mail discussions

Social/Affective Strategies

Strategy	Description	Suggested Technology Supports
Cooperation	Work with peers to solve a problem, pool information, check notes, or get feedback on a learning activity.	Conferencing, e-mail listservs, decision software, simulations
Questioning for clarification	Elicit additional explanation, rephrasing, or examples	Conferencing, e-mail listservs
Self-talk	Use mental redirection of thinking to assure oneself that a learning activity will be successful or to reduce anxiety about a task.	Word processing, outliners, flowcharts
Self-reinforcement	Provide personal motivation by arranging rewards for successful task completion and learning.	Games, conferences e-mail

Shift 3: Technology: An Infrastructure for the Learner-Centered Class

We cannot effectively, efficiently and successfully create a truly learner-centered environment without access to appropriate technologies. Technology provides easy access to tools, information, and communication environments through which students gain new learning opportunities. However, this increased access creates the need for teachers and students to develop effective technology use and information management skills. How can technology transform a lecture-based class into a learning experience? Let's look at a few of the many possible opportunities for a shift to interaction through technology

Traditional Approaches	Technology Supported Opportunities
Lectures	**Lectures for guidance purposes supplemented with**
1. Delivery	1. Video delivery
2. Students may take notes	2. Lectures on web
	3. Presentation software enhancement
	4. Information organization activities
Text-based readings	**Texts and real world materials**
1. Reading	1. Library
2. Summaries	2. Databases
3. Reports	3 Web-based materials
4. Answers to questions	4. CD-based materials
Discussions	**Collaboration and Discussions**
1. Face-to-face	1. Face-to-face
2. Teacher-to-students	2. E-mail (one to one)
3. Small groups	3. Listservs (one to many)
4. Pairs	4. Computer conferences (interactive)
5. Debate format	5. Video conferences (interactive)
6. Reporting structure	6. Web-based reports and reactions
Research	**Research**
1. Library	1. On-line databases
2. Labs	2. Simulations
3. Interviews	3. Contact with experts through web-pages or directly
	4. On-line articles
	5. Library searches
Experiments, problem-solving, critical analysis	**Experiments, problem-solving, critical analysis**
1. Labs	1. Cooperation and collaboration
2. Homework	2. Simulations
3. Projects	3. Guided analyses
Feedback	**Interaction, collaboration, feedback**
1. Office hours	1. E-mail
2. Written responses	2. Participation in on-line discussions
3. Discussion responses	3. Face-to-face discussions
	4. Teachers, peers, experts

Video and computer conferencing create on-line collaboration environments for information sharing, data collection, decision-making, problem-solving, and more. Networked software that facilitates decision-making and problem solving through simulations, games and guided activities provide additional opportunities for teachers and students to interact with each other during and beyond the time and space confines of the class. Thus, problem-solving, critical analysis and assessment become on-going, task-oriented events that can involve experts and other collaborators with different focuses and knowledge. Active involvement of teachers, experts, and learners in problem-solving, analysis and organization processes helps learners acquire life and work skills while applying new information in novel ways. Thus students move beyond reception to use and become involved in a personal and meaningful learning experience that can lead to information retention.

Technology can facilitate the growth of personal interactions. Our challenge as teachers is to find ways to maximize the learning potential of students by using appropriate technologies as teaching and learning tools that make learning tasks, information access, and communication easier, more inviting, fun, and effective.

In the past, we have chose available technologies and then attempted to create uses for whatever is accessible. The technology has manipulated teachers, resulting in teaching environments that impose computers, audio/video supplements on traditional delivery formats. Now we are prepared to control the technologies and to make selections that further our instructional goals while offering learners the opportunity to utilize their personal styles and strategies.

We have a greater understanding of how learning occurs, how technology can enhance access and productivity. The life of the student changes as the technology facilitates a focus on their needs and transfers responsibility for learning to them. Gone are the days of memorizing facts for an exam ... and forgetting them immediately. Learning becomes a process of acquiring the tools necessary for find, selecting, organizing and applying information that is appropriate for solving a problem, analyzing data, criticizing decisions, and more. The large lecture class transforms itself into a personalized experience. Students receive directions from the professor through a traditional lecture, personal contact, by accessing a video or on-line information. They collaborate with peers either face-to-face or through on-line means. They find and organize information that addresses their needs and interests then apply that information to solve problems, analyze information, and reach decisions. They do this from home or within the classroom. They are responsible for completing projects in order to participate with their teams in information application activities. They become responsible for supporting their peers by completing their share of the learning tasks and for assessing the quality of their peers production. Learning becomes a group effort that demands input from all members in order for all of the pieces to fall into place. This requires student as well as teacher input into the evaluation process since the groups will not necessarily produce the outcomes envisioned by the teacher.

Shift 4: Providing Support for Change: The Faculty Development Partnership

The transformation into a learner-centered environment cannot happen without a change in the roles teachers play in the learning process. Nor can it occur with out access to technology as well as to support personnel for the development of new learning environments. Teachers must be inspired to change through an understanding of how new instructional approaches will further their goals and aid their students in attaining desired outcomes. They must be trained to select then use appropriate technologies to create new learning environments. And finally they must be given the opportunity to become independent users of expert tools for the purpose of creating new learning environments. Development of teachers requires a complex training, development, and sustainment program that supports emerging as well as advanced developers in their endeavors to create and deliver new couseware.

As a first step toward transforming itself into a learner-centered research university, the University of Arizona has shifted its focus to enhancing the learning process rather than continuing to concentrate on modifying traditional teaching or presentation methods. Students and faculty are encouraged to become life-long learners, using technology in the learning environment to facilitate

information access and organization, data collection and analysis, and communication between learners. Students find new opportunities to pursue their individual learning interests and to enhance their experiences by using technology that is associated with their own career goals as a means of accessing information, solving problems, and communicating with peers and experts. Faculty are supported in their instructional change endeavors by a campus-wide Faculty Development effort that meets changing instructional needs as instructors shift their attention from curriculum driven goals to learner needs.

As a means of supplying support for a variety of individual projects, the administration encouraged faculty and support personnel from a variety of units to establish the Faculty Development Partnership. This Partnership provides a flexible technological and pedagogical infrastructure for instructional research and curriculum development. The Faculty Development infrastructure is an extensive network of partners and referral units that provide faculty with the technology access, funding, and personal support. Through this infrastructure, faculty become familiar with new learning theories, innovative teaching methods, curriculum design techniques, and technology use.

Participating units in the Partnership include:

The Center for Computers and Information Technology provides telecommunications and campus network support as well as general consulting through the HELP desk, advanced computing and consulting through its Multimedia and Visualization Lab, and access to current software library through the Faculty Resources for Instruction. CCIT Research Support assists in the design and analysis of instructional research projects.

The University Library serves as a gateway to electronic information sources worldwide. Librarians develop and support information literacy among faculty and students, emphasizing life-long learning in a technology based, global information society.

The University Teaching Center offers the New Technologies Training Program for faculty who are new to high technology teaching tools. In addition, all faculty can obtain the most current information on learning theories and teaching methods through the Center's library and seminars.

The Peter Treistman Fine Arts Center for New Media specializes in animation, video and audio editing, and graphics design. Faculty use high technology artistic tools to refine their instructional materials for clear, effective visual communications.

VideoServices supports the University of Arizona faculty through production and transmission of local and distributed learning environments. Satellite, microwave, digital video, cable, and wireless cable technologies are used to distribute education material. VideoServices is an educational broadcast resource of the University of Arizona and member of the KUAT Communication Group.

The Partnership Coordination Office coordinates all research and workshop projects. It administrates the activities of the Partnership and its interaction with other organizations for curricular change, such as the Instructional Resources Coordination Council, the Faculty Development Team, the University Composition Board, and the Faculty Fellows. It also participates

in efforts to create partnerships with corporations and community groups to establish an extensive external support network for faculty projects.

The uniqueness of the Faculty Development support infrastructure lies in the its comprehensive programs and creative use of resources. Established programs include symposia and workshops for information distribution purpose; training programs for new users; a grants program to initiate and expand curriculum change projects; and expert support for faculty seeking to bridge the chasm from emerging users to independent courseware creators. The Faculty Development Partnership provides the infrastructure by coordinating all support activities. The five independent units mentioned above have abandoned traditional roles in order to focus on providing collaborative and cooperative support for faculty. The units have worked to identify common goals and individual strengths in order to provide maximum support for all projects without duplicating effort or ignoring any need. The result has been a smooth transition system that attracts novice as well as intermediate and advanced users and directs individuals to appropriate support structures. Those who enter the system are mentored by members of the Partnership and nurtured through out the life of their project.

Novice users may enter the Faculty Development support system by seeking services from a variety entry points. Typically, a group will learn about Faculty Development initiatives through a symposium, workshop, or through a department or college-wide meeting with the Partnership Coordinator. Basic training options include e-mail and Internet training through the University Library, computer conferencing training through the Center for Computing and Information Technologies, and a global approach to technology use through the New Technologies Training Program. The latter that involves all Partners in a comprehensive introductory program. There, faculty receive hands-on training in the selection and use of appropriate technologies for teaching/learning enhancement. Topics include basic computer use, teaching methods, presentation software use, decision lab strategies, and Internet strategies. Graduates of this program receive a development package (computer, printer, and scanner) as an incentive to apply their new skills immediately.

Intermediate users receive support in multimedia production through CCIT and the Treistman Center. These two units collaborate to provide design support for faculty who have received basic training in software use, HTML programming, and Internet strategies through one of the previously mentioned programs. At this level, faculty focus on creating interactive packages that promote learner independence and incorporate opportunities to use personal learning strategies. UTC and volunteer faculty help developers at this level design products that are theoretically sound instructional packages.

Advanced users collaborate with programming, animation, and graphics design experts from CCIT and the Treistman Center and with support personnel from corporate partners to develop innovative instructional packages that emphasize new uses of the technologies. These partnerships yield learner-centered courseware that in turn creates the need to establish new training standards and procedures for the faculty who follow. Once these new tools are created, Video Services, CCIT, the Treistman Center and the Library help faculty design unique delivery options that maintain personal contact while transcending the limitations of time and distance.

Shift 5: Evaluation of Students and Faculty

One critical area of learner-centered environments is testing. How do you test students who tend to forge their own individual path through knowledge? How do you determine wise application of facts? How do you demand that they know particular facts when learning is so individualized? First, the course need not exclude simple memorization of facts. This aspect can assure a common database from which the students work. The problem is that it often excludes other data from the students path. Students have other courses to study for and they will most often do the minimum for each course.

One of the best ways of testing students in this environment is the electronic portfolio. Students can have a set of assignments that include an annotated bibliography for the course readings, a position paper on some topic, a research report, and the like. All such assignments can exhibit both textual and visual communication skills. Stored on a server, the portfolios can be easily monitored and critiqued throughout the semester, achievers can be rewarded and sluggards encouraged. The portfolio design can be given in strict or loose terms. The bottom line is "the clear and wise demonstration of the application of concepts associated with a given field."

A mother of five once persuaded her five-year old to do his chores and then remarked to me, "Children will do anything willingly that they feel allowed to do." One role of the instructor is to put students in an environment where they perceive a need to know something, where they have the desire to discover using modern tools of their trade, and where they feel the freedom to be creative in their presentation of knowledge to others. Isn't this what we seek in our own professional work?

Our primary teaching interest should be in allowing others to learn important subject matter and not in establishing our position of authority in an area of study. Fields of study change quickly. What if the student discovers a web site with information which contradicts points in your lecture? May he or she come to you with that information? Is it not important for students to learn the methods of respectful presentation of an opposing viewpoint as well as the concepts on your syllabus?

Such interaction changes the role of students from passive to active learners. Teachers shift from information deliverers to learning facilitators and guides. High technology helps create a learning infrastructure that allows more communication between learning parties than previously possible. Our next step will have to involve the establishment of new assessment criteria that take into account strategies, styles, and the unique learning opportunities offered by technology. Tools that are based on the criteria of the old, teacher-centered learning paradigms do not serve in the learning world of the twenty-first century. The collaboration, cooperation and team-oriented research that the corporate world now values are called 'cheating' under the existing evaluation paradigm.

Nor can we continue to evaluate and reward faculty under the traditional system. Higher education leadership must recognize the emphasis on preparation and the research that goes into creating an interactive, course that takes advantage of background information and data from a variety of disciplines. Time in the classroom must cease to be a criteria for how hard a teacher works. Learner-defined outcomes must become an indicator of success. Teaching must be seen as part of the life-long learning process rather than as a means of delivering specific information.

Shift 6: Overcoming Obstacles

Moving from a traditional education system to a learner-centered one requires profound change in a number of areas. Students become partners in the learning process who develop information management, critical thinking and critical analysis skills. Teachers learn to select and employ technologies in order to free learners to use their own strategies and styles. Institution adopt an attitude of support, guiding and helping faculty as they strive reach expert levels of control of learning theories, methods, curriculum design techniques, information search, retrieval, and organization procedures, and courseware design. Rewards systems change to recognize and honor innovative teaching and course development efforts.

No one unit can provide such a comprehensive support system, thus it is vital that units combine efforts to create a comprehensive infrastructure. An integrated approach based on partnerships, mentoring, and resource sharing avoids duplication of effort and surrounds faculty with the support they require to create innovative learning environments that meet learner needs. We members of the Faculty Development Partnership at the University of Arizona suggest that faculty development efforts ...

- a leader in the central administration to carry the message to 'high' levels;
- integrate all aspects of technological and instructional support into a single support system;
- focus on faculty volunteers who are willing to take risks;
- enable creative development initiatives;
- provide easy and adequate access to appropriate technologies;
- focus on goals rather than on territories;
- emphasize faculty-to-faculty mentoring opportunities to expand the support system into individual disciplines;
- encourage and design changes in the institution's rewards system;
- cultivate external partnerships with corporations and community.
- move through three recursive stages of development:
  - basic training in theories, methods, curriculum design, technology use;
  - innovative applications of new skills and knowledge;
  - independent use of expert tools.

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